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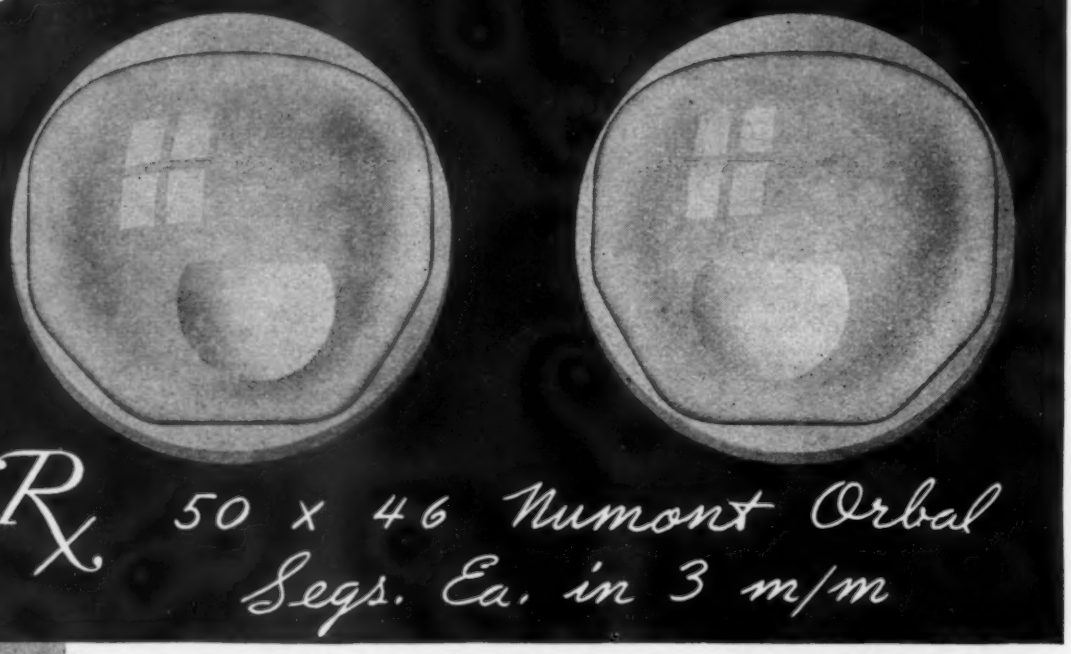

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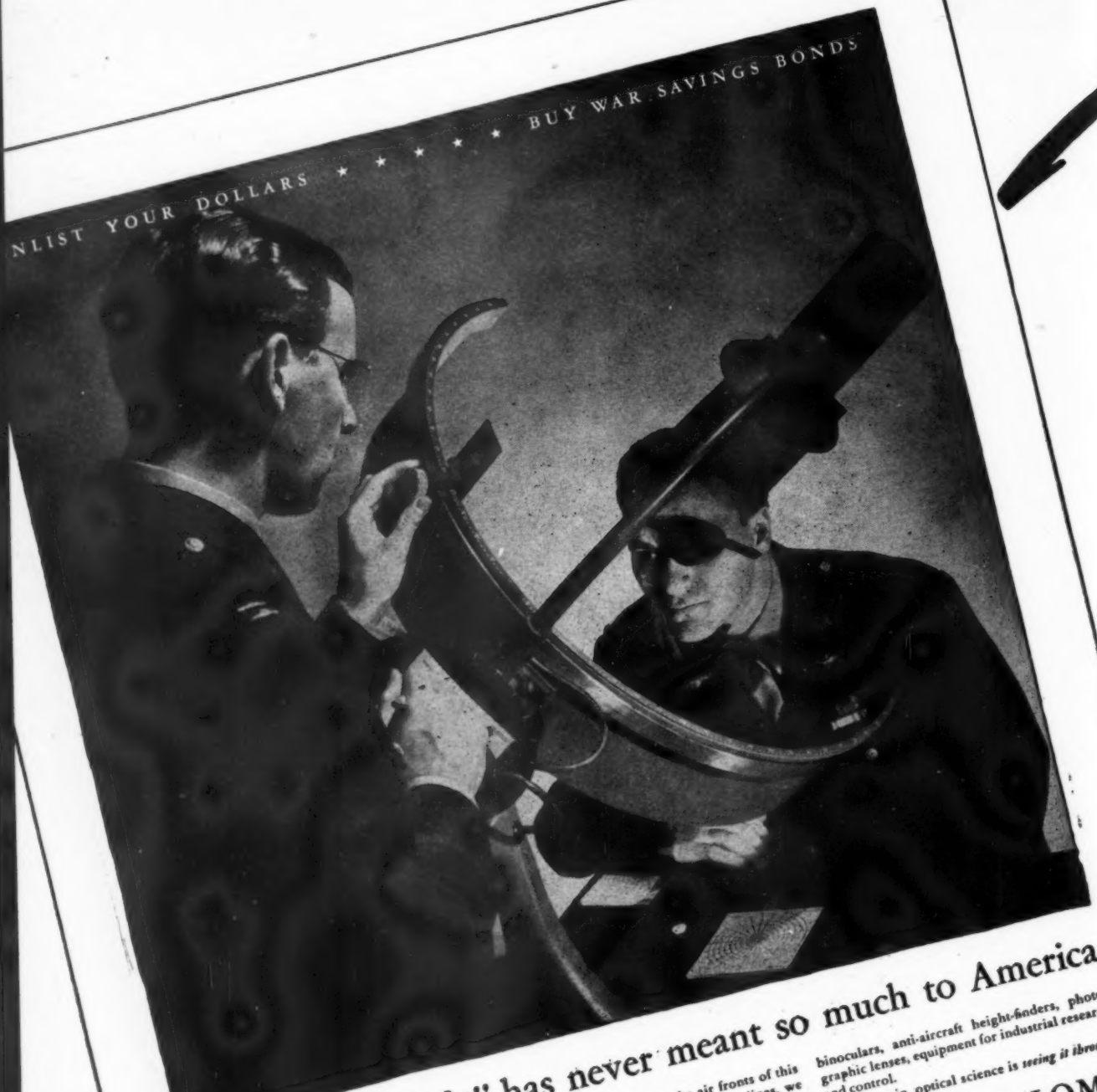

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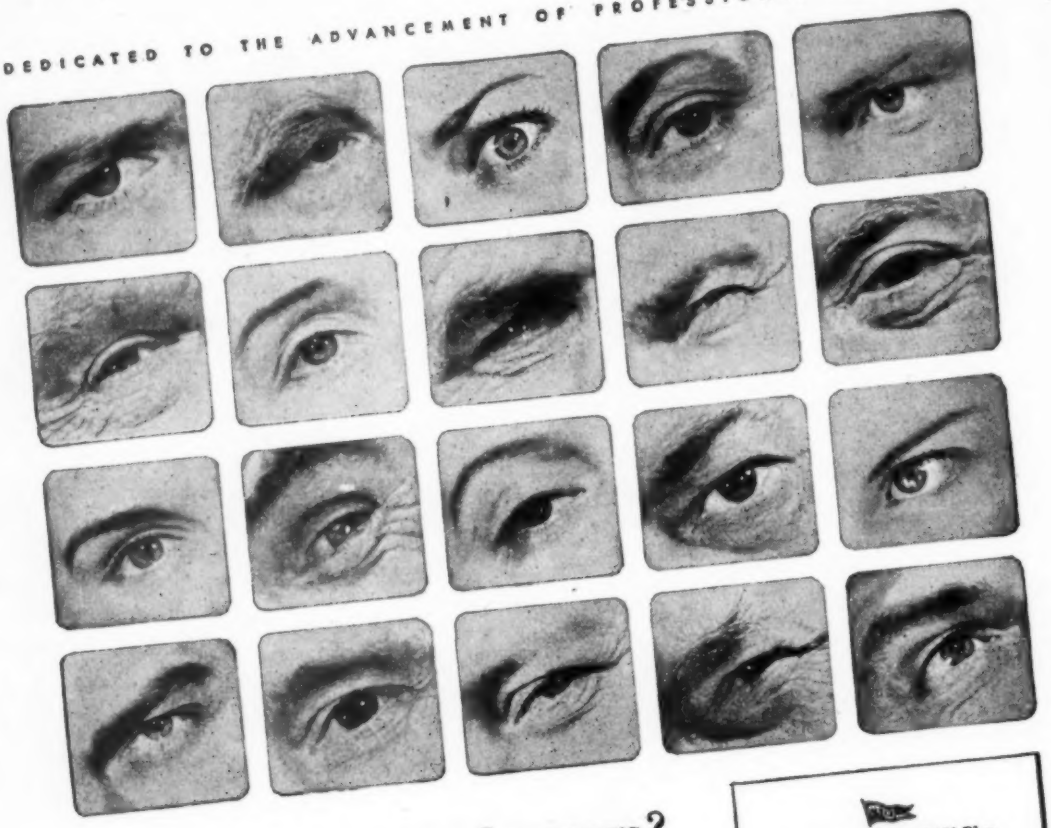

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Perhaps. But only in appearance. Eyes may resemble one another, but no two eyes are exactly alike.

Even your own two eyes may not be perfect mates, and probably they do not see alike.

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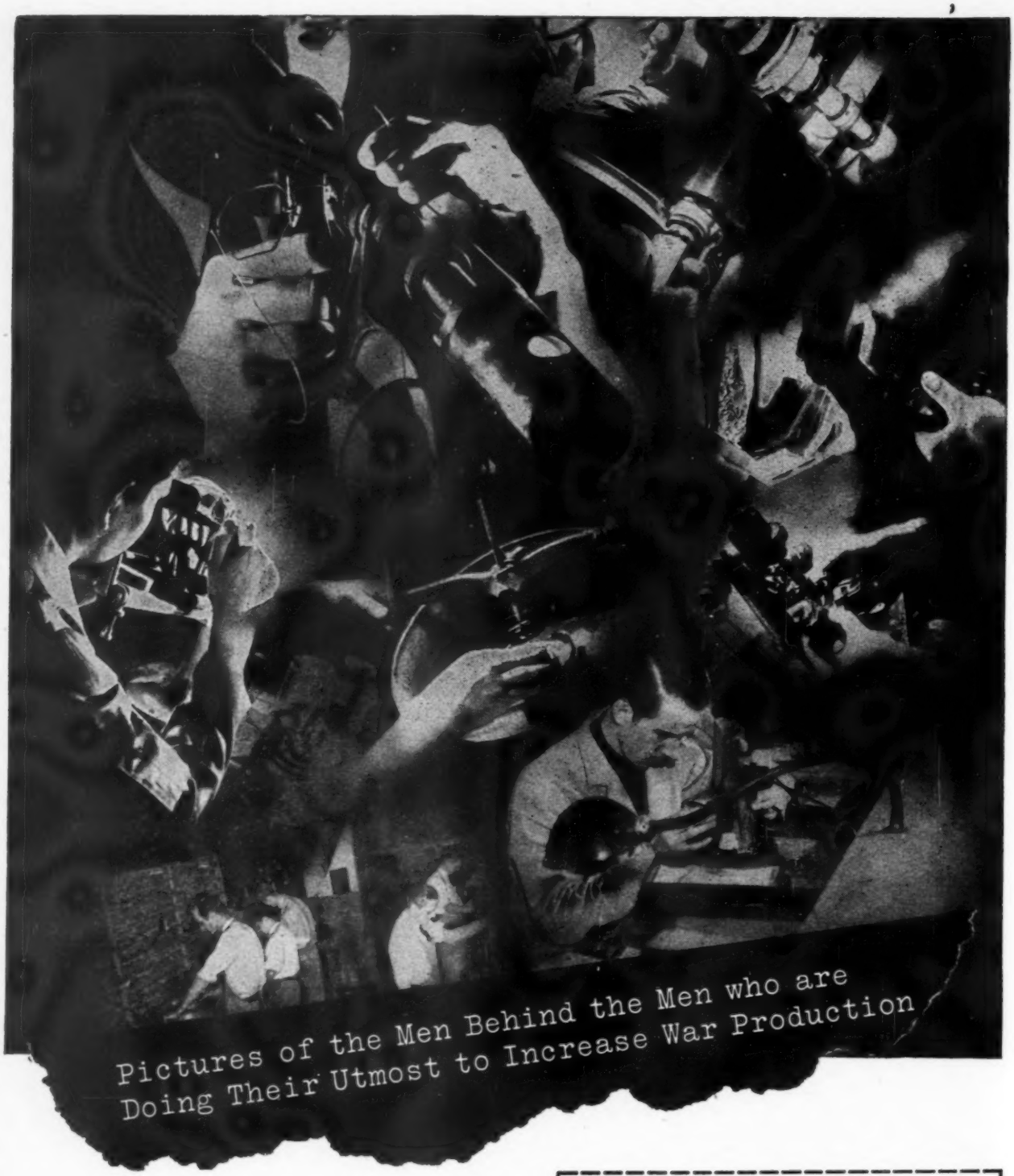

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Vol. 20 CONTENTS No. 8

THE DARTMOUTH REMEDIAL READING PROGRAM*

Henry A. Imus, A.M.; John W. M. Rothney, Ed.D., and
Robert M. Bear, Ph.D.
Dartmouth College, Hanover, N. H.

Purpose. The aim of the Dartmouth remedial reading program is to provide instruction for as many freshmen and upper classmen as can be expected to profit from it. It will be noted that such an aim places the immediate instructional service to students before general experimental or research functions. It thus precludes the selection and handling of students in many of the ways demanded by the latter. On the other hand, it is realized that any effort to improve such complex processes as reading and study is in itself experimental and needs the most careful scrutiny and checking with the instructional aim.

General Plan. A number of factors were considered in the arrangement of the general plan for remedial work. The character of the reading disabilities, insofar as they could be determined by survey tests, was of primary importance. Examination of the Iowa scores showed that the students scored as well or better in both rate and comprehension respectively as the norms given by the authors of this test. Yet, even by the test norms, 10.5 per cent were at the twentieth percentile or below in rate compared with 5.6 per cent who were as low in comprehension. Published studies from Smith College and the University of Chicago, where there are selective admission procedures, report greater numbers deficient in rate than in comprehension.[1] In this connection, a study of the Iowa Test indicates that the comprehension scores of slow readers are greatly reduced because of their lack of speed.[2] This fact seemed

[1]Blake, M. B., and Dearborn, W. F., *The Improvement of Reading Habits*, Jnl. of High. Educ., VI, Feb., 1935, pp. 83-84. Reeves, F. W., Peik, W. E., and Russell, J. D., *Remedial Work in Reading at the Freshman Level*, Instructional Problems in the University of Chicago Survey, IV, 1933, pp. 148-149.

[2]Robinson, F. P., and McCollum, F. H., *Reading Rate and Comprehension Accuracy as Determinants of Reading Test Scores*, Jnl. of Educ. Psych., 25, Feb., 1934, pp. 154-157.

*An abridgement of the material appearing in Chapter V, An Evaluation of Visual Factors in Reading. Henry A. Imus, John W. M. Rothney and Robert M. Bear. Copyright 1938 Dartmouth College. Submitted on April 23, 1943, for publication in the August, 1943, issue of AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

significant in our interpretation of the need for remedial work with the freshmen of Dartmouth College.

The status of the class as a whole in vocabulary development was quite satisfactory. Only a very few were seriously deficient. On the vocabulary section of the Cooperative English Test the class median scale value was 65, which is 5 points above the average scale value made by college preparatory students. Only 4.9 per cent of the Dartmouth freshmen scored at, or below, 52. (The median scale score for unselected students at the end of the twelfth grade is 50.) On the vocabulary section of the Iowa Test, less than 3 per cent scored below the twentieth percentile test norms. It appeared, therefore, that vocabulary deficiency was not a major problem among our students.

It is assumed by many that improvement in the rate of reading can be made in a relatively few periods of instruction, but the extent to which the improvement of comprehension can be achieved is not so evident. The provision for practice in the skills basic for better comprehension in reading usually requires more time than the provision for practice in increasing the rate of reading. Relatively few students were seriously deficient in comprehension, a condition which was to be expected under the selective plan of admission. The high standing of entering classes on the American Psychological Examination indicated that the students possessed the ability requisite for satisfactory comprehension.

Practically all the students of each group were deficient in rate of reading, but the deficiencies differed in degree. They also varied in the probable causes of difficulty, as well as in relative competence, size of vocabulary, skill in comprehension, scholastic aptitude and other aspects of proficiency. Therefore, a comprehensive type of remedial procedure was attempted, which was essentially the same for all groups except Section 7.

Selection of Students for Remedial Work. The policy of the College Administration required that a large number of men be reached by the remedial program adopted. This requirement was largely the result of an expression of the favorable reaction toward the results of a section in "speeded reading" which had been offered to a volunteer group of students as occasion warranted during the preceding six years. This limited offering of a type of instruction which emphasized speed had demonstrated its effectiveness with large groups.

From an administrative point of view, the scheduling of remedial

reading sections for freshmen to meet more than two periods a week in the afternoon (except at some undesirable hour such as five o'clock or at night) was impossible. Special sections in English composition, physical education and recreation already required early afternoon hours and, as a result, considerable shifting of schedules was necessary to obtain two additional free periods a week for each student. An unfortunate result of this complexity of schedules was that it became impractical to segregate men into homogeneous sections which were sufficiently large and which could meet at convenient hours.

No data, which would indicate precisely how many freshmen at Dartmouth needed or would profit from remedial instruction, were available, so several different plans for selecting students were tried.[3]

In general, during 1936-37, three different approaches were made in an effort to determine the extent of the need for remedial instruction. All freshmen were given the Iowa Test of Silent Reading and some of those making low scores were asked to come for instruction. A number of students who had unsatisfactory scholastic records (especially in social science or English) at the mid-semester or at the end of the semester, and who, at the same time, had been below average in reading skill on the September test, were asked to enroll. Finally, students were allowed to volunteer for instruction. In every case, although a student might be requested to do the work, it was not considered obligatory. He might attend or not as he pleased.

The first group of men who received training was selected during the opening week of the academic year (1936) on the basis of scores on the Iowa Test of Silent Reading (Advanced Form B). Study of the scores showed that, although the class averages in both comprehension and rate were above the norms set by the authors of the test, a number of freshmen were seriously deficient when their scores were compared with these norms. Since there was no experince at Dartmouth to indicate levels of performance below which students are genuinely handicapped, it was necessary to make an arbitrary selection and let the results of the year demonstrate its effectiveness.[4] A trial selection for immediate instruc-

[3]Published studies indicate that at other colleges from 10 to 20 per cent of the members of any entering class are seriously deficient in reading ability, while many others have marked disability.

[4]From the test data obtained in 1936, tentative standards of effective and ineffective reading skills at Dartmouth College have been drawn up.

tion was made in September by taking (1) those students with scores below the sixteenth percentile in comprehension according to the Iowa norms, and in the lowest fifth of their class on the American Council Psychological Examination, (2) those below the Iowa twentieth percentile in both comprehension and rate and (3) those below the Iowa fifteenth percentile in rate.[5] These students composed Sections 1, 2 and 3.

When new groups were selected at the middle of the first semester those whose need was discovered by instructors in charge of freshman courses in social science, philosophy and English were enrolled. The English Department made a general announcement in its classes and secured the names of 97 interested freshmen, some of whom were already at work in one of the first three groups. Of the remaining number, only those with a reading rate of 230 words per minute or less on the Iowa Test were notified of an opening in the sections then being formed. Those who read faster than that rate were given the opportunity to join sections formed in February. Other students were permitted to volunteer for instruction.

Sections 4, 5 and 7 were filled from two sources, (1) students reported to the Freshman Council at mid-semester because of poor academic work and who read below the average level and (2) volunteers. A total of 45 students attended six or more instruction periods and took the final tests.

A fourth section organized at this November mid-semester period was composed of upper classmen from a group of about 40 who had responded to an announcement concerning the course printed in the college newspaper. Suitable schedules were found for 30 of the applicants, 21 of whom attended six or more periods and completed the work. A similar notice of a section open to upper classmen, following the Easter vacation, resulted in the selection of 23 students who attended six or more periods and took the final tests.

Among those placed on probation at the end of the first semester, there were 23 freshmen who were below average on the September Iowa Test of Silent Reading. These students had not attended one of the previous reading sections. Among those who failed or made a low mark in the first course in social science or English, there were 33 more who had made below average scores on the Iowa Test in September. From these and from volunteers of freshmen and of upperclassmen Sections 8,

[5]Of the 65 men selected, 4 could not be scheduled and 11 attended less than 3 periods or were excused.

9 and 10 were formed with a total of 60 students who attended at least six periods and took the final tests.

Summary of Selection. An inventory of the number of students attending at least six periods of instruction (including the final test period) shows 45 students who were requested to do the work primarily because of unsatisfactory scores on the reading test in September, 97 who volunteered and 52 who were poor to average readers and whose attendance was suggested because of unsatisfactory scholastic records, especially in social science or English. Of the grand total of 194, there were 143 freshmen and 51 upper classmen. A larger number from both these groups were given some instruction, were made acquainted with the unsatisfactory status of their reading skill and were given written suggestions concerning the type of improvement needed.

The precise number of times each section met and the dates of beginning and closing work were influenced both by the academic calendar of the college and matters of administration. The work of Sections 4, 5, 6 and 7 was spread over a longer time because of the interruption caused by the Thanksgiving and Christmas holidays, while that of Sections 8, 9 and 10 was similarly prolonged by the Easter vacation. With the exception of the upper class group (Section 11), which contained a number of seniors, the sections met approximately the same number of periods. They are summarized in Table I, which follows:

TABLE I

Number of Meetings (Giving Dates of First and Last) of Remedial Reading Sections of Subjects of Dartmouth Visual Survey, Classified According to Methods of Selection.

Section		Meetings Dates		
No.	Description	No.	First	Last
1 }	Low Reading Test,	10	October 2	November 6
2 }	Comprehension and Rate	11	October 1	November 5
3	Low Reading Test Comprehension and Rate and Low Scholastic Aptitude	11	October 2	November 6
4 }	Volunteers and Low	12	November 19	January 14
5 }	Academic Points	11	November 19	January 14
6	Upper Class Volunteers	11	November 19	January 14
7		11	November 20	January 15
8 }	Volunteers and Low	12	February 17	April 9
9 }	Academic Points	11	February 18	April 8
10		12	February 19	April 9
11	Upper Class Volunteers	8	April 12	May 5

Instructional Procedure. In the first few periods of practice, most emphasis was placed upon increasing the rate of reading. After such

improvement was well under way (by the sixth to the eighth period, depending upon the group) comprehension skills were stressed. Emphasis upon rate was continued during part of each period.

At the opening of each period (after some comment upon group and individual progress to that point, along with suggestions for the direction of further effort), students would turn to a designated page in M. E. Bennett's *College and Life* [6] and read four pages for the purpose of "warming-up." There followed three minutes of reading, timed by a stop-watch and directed as follows: "Read as well as you can for the ideas," or "Read as well as you can and in the way you need to for your greatest improvement," or "Get the main ideas, but get them faster." The number of words read per minute by each student was computed and recorded on his individual graph. The class average for the day was also computed and plotted on a large graph which was hung on the wall. Students were constantly urged to learn the reasons for their increases and decreases in rates as a means of achieving control over their reading. With little variation, each section read from the same passages in *College and Life.*

Another device which was used eight periods with each group was a three shuttered tachistoscope sold under the trade-name of Metron-O-Scope.[7] Use was made of one roll per period in hope that students who regressed habitually would be made aware of the fact, and that some types of plodding readers would be helped. It proved an interesting and stimulating variation in procedure. Immediately after using the Metron-O-Scope, students were required to read in their practice book, *College and Life,* in order to take advantage of any possible transfer in skill.

For approximately fifteen minutes each, during the seventh or eighth periods (the sixth period only with Section 11), a rapid exposure lantern with a camera shutter was used to project sentences on a screen at rates of from one-ninth to one-fifth of a second per line. Although the instructor had some doubts concerning this procedure, it was done in order to provide exercises in rapid word recognition. It was also used to provide material for illustration and discussion of the method by which a person using a book or magazine might (as has been claimed) widen his recognition span.

From the second through the fifth period, there were fifteen minute

[6] McGraw-Hill Book Company, New York, 1933.
[7] Distributed by the American Optical Company, Southbridge, Massachusetts.

discussions of the mechanics of reading (including eye-movements and vocalization), the need of adapting one's reading to his purpose and the material read, concentration and attention with their control, and factors affecting rate of reading. The material and practical suggestions of each of these discussions were placed on the blackboard to insure group attention to the points explained. In connection with the study of the mechanics of reading, students were shown the film *Eye-Movements in Reading* by Troyer and Valentine and then asked to observe each other's eye-movements by means of mirrors.

As an aid to comprehension, some information was supplied concerning factors involved in better understanding. Practice in the ways in which it should be sought through the reading of regular assignments was provided. Two additional blackboard discussions dealing with the nature of comprehension and suggestions for its improvement were held. The sections containing students with poor scholastic records examined a mimeographed set of questions concerning methods of study and work which called to their attention desirable changes in their study habits. Valuable procedures in note-taking were also discussed.

Practice material was found in Salisbury's *Better Work Habits in College*[8] and in mimeographed passages which were read in different ways. These included (1) finding the author's point of view; (2) noting the central theme; (3) discovering clues to the author's organization of thought; (4) finding topic sentences; (5) selecting the most accurate of several statements of the thought of a passage; (6) answering factual questions regarding what was read and (7) predicting the thought of a paragraph from reading the opening sentence.

Individual and group suggestions for vocabulary improvement were given from time to time, and a blackboard discussion at the tenth or eleventh period was devoted to this topic. The treatment of problems of recognizing unfamiliar words through analysis was done by presenting large charts of common prefixes, suffixes and illustrative words. Students were asked to check those with which they were unfamiliar. After each section had met two or three periods and the instructor's observation of the individual's reading in *College and Life* was available as a supplement to test results, a very brief summary of the findings, with suggestions concerning the chief lines of needed effort, was made for the student. These summaries were written on the back of the individual's graph

[8]Scott, Foresman and Company, Chicago, 1932.

sheet and were there for him to see at each practice period. Several examples of these statements may be quoted for illustration:

Student 17 from Section 1 (very low in scholastic aptitude rank) —"Chief deficiency—lack of comprehension in your reading. Your low rate is probably due to the former in good part. Your vocabulary needs to be increased and this will aid in improving your comprehension. Do not let the effort to increase your speed prevent you from directing attention to improving comprehension. This is the primary matter in your case. On the other hand, you will have to speed up some to get over assignments. If you can do it without decreasing your present degree of understanding, you will have gained."

Student 13 from Section 4 (very low in scholastic aptitude rank) —"Average or better in vocabulary but low in comprehension and rate of reading. You need to exert special effort to increase both rate and comprehension. A gain in the former, if no loss in the latter results, would be a net gain, however. You might analyze your methods of study as a whole with profit."

Student 25 from Section 9 (slightly better than average in scholastic rank)—"On one test, you are slightly better than average in comprehension, on the other, below average. You are below average in rate of reading and vocabulary. There seems to be no reason why you should not be able to get as much or more comprehension as at present but at ultimately much faster rates than you have yet approached. Keep making yourself read faster."

Additional interpretation of the findings and suggestions based upon them and the further progress of each student were made individually during practice and in conferences. All groups were constantly reminded that every effort should be made to apply the methods and knowledge acquired to the preparation of regular assignments in courses.

The procedures for the subjects of Section 7, who had already had one half term of instruction, varied from the usual methods. They were designed primarily to continue practice in comprehension skills for certain deficient students. A few other men who were quite low in comprehension skills upon the Iowa Test were assigned to Section 7. Some students who were unable to make an immediate appreciable gain dropped out after attending two or three times.

At the initial and final periods, comprehension was tested by the

Minnesota Reading Examination for College Students.[9] There was no emphasis upon rate of reading, but at each period various paragraphs were analyzed for the important ideas, central meaning was determined, clues to the author's organization of thought were sought and accuracy of reading for detailed knowledge was tested.

Charting of progress was again employed and students were supplied with written statements of their reading weaknesses and needed improvements. Blackboard discussions of time budgeting, study habits, taking and using notes, vocabulary building and preparing for examinations were conducted. Every effort was made to make members of the section conscious of their limited vocabularies.

Control Group. Formation of a control group in the desired way was impossible because of the stated objective of making the remedial work available to any freshmen needing it or expressing a desire for it. It was decided, therefore, that, for comparative purposes, the remainder of the freshman class, excluding all students who had had any contact with the remedial instruction, would be utilized. When the separation had been made, 383 students of the Class of 1940 remained.

Results of Remedial Instruction. A view of the results may be had by comparing the scores on Form A of the Iowa Test of Silent Reading administered the first week of May with the scores made on Form B in September. Since the 51 upper classmen of Sections 6, 10 and 11 were not in the English classes where the Iowa Test was taken by freshmen, they are excluded from the analyses which follow. Sixteen freshmen, who were trained but whose test records are not complete, are also eliminated. There are, then, 127 remedial students whose changes in reading ability are to be reported.

It should be explained that the rate test of the Iowa (sub-test 6) was re-scored by counting the number of words in the two minutes allowed and reducing the total to the words read per minute. Thus, as measures of speed of reading for each student, we have both the rate score provided by the authors of the test and the mean number of words read per minute. The advantages of this second measure of rate are easier interpretation by the student, expression in units comparable to those of the Booker Test of Achievement in Silent Reading,[10] the greater range

[9]"Minnesota Reading Examination for College Students" (Forms A and B), Melvin E. Haggerty and Alvin C. Eurich, University of Minnesota Press, Minnesota.

[10]The four forms of this test were developed by Dr. Booker at the University of Chicago and are described in his dissertation, *The Measurement and Improvement of*

in dispersion of scores it provides and the probable greater validity of this method of scoring rate.

Initial Status. The reading status and scholastic ability of the students in the various remedial sections may be observed in Table II. It will be seen that the mean score on the aptitude test for all the remedial cases is 197.9, while the mean scores on individual sections 3 and 7 are as low as 149.7 and 147.2 respectively, and as high as 226.5 in Section 5. The 383 students of the remainder of the control group make a

TABLE II

Mean Scores on Scholastic Aptitude and Iowa Reading Test of the Remedial Reading Groups and of 383 Other Subjects of the Dartmouth Visual Survey.

				Iowa Test (B)		
Sections		N	S. A. T. Total	Comp.	Rate	Wds. /Min.
Control Group*		383	241.3	166.4	36.8	255.9
Remedial Groups		127	197.9	137.3	26.4	196.6
Remedial Group**	1	19	165.8	119.6	20.7	170.0
	2	11	176.8	120.4	19.5	155.0
	3	11	149.7	109.9	23.4	182.3
	4	18	218.3	141.6	28.5	208.2
	5	22	226.5	148.9	29.0	209.4
	7	9	147.2	105.7	25.0	185.4
	8	19	201.0	141.8	28.3	207.8
	9	17	230.5	157.0	30.0	218.1
	10	7	189.4	149.5	27.4	193.4

*Composed of 383 Freshmen who did not have remedial instruction.
**See Table I for basis of group selection.

mean score of 241.3. Similarly, it will be observed that the means of the control group are far above those of the remedial group in comprehension, rate and words read per minute, while wide differences in each of these respects are found in the various sections.

Gains in Reading Skill. Table III presents the gains or losses on the

TABLE III

Comparison, by Mean Differences and Critical Ratios of Differences, of Remedial and Control Groups of Dartmouth Visual Survey, in Comprehension and Rate Scores on Iowa Test of Silent Reading.

	Groups			
Iowa Test	Remedial (N=127)	Control (N=383)	Differences	Critical Ratios
Comprehension	21.6	13.8	+7.8	5.1
Rate Score	6.8	—0.2	+7.0	8.1
Words per Minute	45.4	7.7	+37.7	8.2

Silent Reading among College Freshmen. Their use at Dartmouth was by his permission. Requests for further use should be addressed to him, in care of the Research Division of the National Education Association, Washington, D. C. See Appendix E.

May Iowa Test, Form A, compared with scores made on Form B in September for both the remedial group and the control group. The mean gains of the former are 7.8 points higher than the latter in comprehension, 7.9 points higher in rate and 37.7 in words per minute higher than the latter. In rate score, the control group shows a negligible loss. That these differences in gains are due to something other than chance is shown by the fact that critical ratios are in the case of comprehension 5.1, rate 8.1 and in words read per minute 8.2. Remedial instruction can be assumed to be one of the most important causes of the differences obtained. Other possible causes are the scholastic aptitude of the student and his initial reading proficiency.

Mean gains and losses do not show precisely what may have happened to the several individuals' skills and, thus, an analysis is needed of the number of students who gained, remained the same or lost in reading proficiency. This information is supplied in Table IV. While the percentages gaining and losing in comprehension do not differ greatly, they favor the remedial group. On the other hand, 26 per cent more of the remedial group than of the control group gained in words read per minute. The significant fact is that the loss seems to have been largely avoided among the instructional cases.

TABLE IV

Comparison of Remedial Group with Control Group of Dartmouth Visual Survey, by Change in Scores in Comprehension and Words per Minute, between Fall and Spring Administration of Iowa Test of Silent Reading.

		Comprehension				Words Per Minute			
		Gain		Loss		Gain		Loss	
Classification	N	N	%	N	%	N	%	N	%
Control Group	383	321	83.8	55	14.4	232	60.6	148	38.6
Remedial Group	127	115	90.6	12	9.4	110	86.6	16	12.6
Differences			6.8		5.0		26.0		26.0

The mean gains or losses of the several remedial sections are found in Table V. Further information for the interpretation of these figures is secured through reference to Table II for the initial scholastic aptitude and reading proficiency scores and through forward reference to the data in the next subdivision of this chapter. In this connection, it is to be recalled that, with Section 7, the sole objective of instruction was the improvement of comprehension skills and vocabulary.

TABLE V

Mean Gains in Comprehension, Rate and Words per Minute between the Fall and Spring Administration of Iowa Test of Silent Reading. The Subjects are the Remedial Reading Groups of Subjects of Dartmouth Visual Survey.

		Mean Gains		
Group	N	Comp.	Rate	Wds./Min.
1	19	23.8	8.6	56.5
2	11	24.7	6.4	48.4
3	11	22.1	6.2	47.6
4	18	21.6	5.9	54.5
5	22	21.1	5.6	56.2
7	9	25.6	2.7	32.0
8	19	23.7	5.9	52.8
9	17	16.7	7.2	55.9
10	7	19.5	9.1	71.7

Since the authors of the Iowa Test provide data for determining the grade levels corresponding to the test scores, study of the remedial cases is made from this standpoint. It should be said, however, that the narrow scale used for discriminating differences in *rate* on this test makes the assignment of one grade level as opposed to another often dependent upon a difference of a single point in score. The tabulation of grade norms shows such a wide discrepancy between levels of comprehension and rate that the questions of the validity of the grade norms, which in turn would be influenced by the degree of reliability of the test of rate, must be raised. It seems likely that this tabulation does not reveal adequately either the initial levels or progress of our subjects in rate of reading. It is presented in order to clarify our presentation of the changes in comprehension and to raise the question concerning the reliability of the rate test, which is discussed elsewhere in this report.

In Table VI the number and percentages of our subjects whose

TABLE VI

Grade Level of Reading Ability of Remedial Reading Group of Dartmouth Visual Surevy in Comprehension and Rate, as Measured by the Iowa Test of Silent Reading. The Subjects are Grouped by Grade Norms of the Iowa Test of Silent Reading.

	Fall Testing				Spring Testing			
Norms	Comp.		Rate		Comp.		Rate	
Grade	N	%	N	%	N	%	N	%
14 or over	49	38.6	14	11.0	91	71.6	64	50.4
13-13.9	41	32.3	9	7.1	25	19.7	9	7.1
12-12.9	18	14.1	14	11.0	8	6.3	5	3.9
11-11.9	17	13.4	10	7.9	3	2.4	1	0.8
10-10.9	—	——	18	14.1	—	——	17	13.4
9- 9.9	2	1.6	28	22.0	—	——	16	12.6
8- 8.9	—	——	31	24.5	—	——	15	11.8
Below 8	—	——	3	2.4	—	——	—	——
Totals	127	100.0	127	100.0	127	100.0	127	100.0

scores fall at various grade levels in comprehension and rate on the September and May Iowa Tests are reported. On the September test, approximately 29 per cent score below the level of grade 13 in comprehension, but eight months later, at the time of the May test, only 9 per cent are still below it. Equally satisfactory progress is not made in terms of scores on rate. Eighty-two per cent of the remedial group score below the level of grade 13 in September while 42.5 per cent score below that level in May. These tables show a movement toward higher levels on the part of many subjects, even if the "college level" is not reached. Two interpretations of the discrepancy obtained between the percentages below grade 13 in comprehension and rate are possible. On the one hand, many more Dartmouth students may be more seriously deficient in rate than in comprehension. On the other hand, the test norms of these two aspects of reading may not be comparable as suggested above. The latter interpretation is preferred since there is a lack of agreement between the percentile scores in rate given in the test manual for college freshmen at the beginning of the year and the rate scores said to correspond to various grade levels. In the first case, a rate score of 30 is at the median, in the second, it is said to correspond to the level of grade 11.9. In spite of this factor, the evidence seems to indicate that there are actually more students deficient in rate than in comprehension at Dartmouth.

At the conclusion of the training periods for all remedial sections the eye-movements of the subjects were recorded on the eye-movement camera. The validity and reliability of this instrument in such measurement is considered elsewhere in this report and should be kept in mind in relation to the findings for the remedial cases. The students of sections ending work at the same time during the year are grouped together for tabulation, since such grouping should yield more valid comparison with the original photography in September and the final photography

TABLE VII

Mean Number of Fixations and Regressions per 100 Words and Number of Words Read per Minute, as Measured by the Eye-movement Camera, in the Fall, End of Instruction and Spring Photography, of Remedial Reading Groups of Dartmouth Visual Survey.

		Fixations			Regressions			Words Per Min.		
			End of			End of			End of	
Groups	N	Fall	Instr.	Spring	Fall	Instr.	Spring	Fall	Instr.	Spring
1, 2, 3	32	85.9	62.7	81.8	16.3	8.8	16.5	289.0	428.9	369.5
4, 5, 7	38	83.2	61.4	79.7	19.7	7.5	15.2	302.2	459.0	380.0
8, 9, 10	42	77.8	60.6	——*	13.4	7.1	——*	327.4	452.3	——*

*The photography at the end of the training periods for these groups was so close to the final Spring photography that the data were not included here.

at the end of April. The results may be seen in Table VII. The measurements made at the conclusion of training generally showed considerable reductions in the number of fixations and regressions per 100 words read, as compared with September. There were also gains of from 125 to 157 words per minute in the mean number of words read. In the photography at the end of April, much of the reduction of fixations and regressions seems to have disappeared, but about 50 per cent of the gain in rate remains.

Possible Factors in Reading Gains. We have shown that the students given reading instruction make significantly greater gains (see Table III) in comprehension and rate than the remaining students of the class. We must now seek an explanation for such gains. Both groups may be expected to make some improvement in score due to familiarity with the techniques of taking a reading test. Neither had advantage over the other in this respect, however, since no test similar to the Iowa had been taken by either group in the period between September and May. The question is raised of the influence which the initial differences between the two groups in scholastic aptitude and in reading proficiency might have upon gains.

It has already been noted that the mean score in September on the Psychological Examination is 179.9 for the training group compared with a mean score of 241.3 for the remaining students of the class. To compare the gains of the individuals of the two groups, they are distributed by percentile ranks at Dartmouth into 5 intervals. The resulting tabulations of mean gains and losses in comprehension and words read per minute for each level are found in Tables VIII and IX which follow. The trained students have mean gains in comprehension exceeding those of the untrained students at such levels of scholastic aptitude. The mean gains in words per minute are greater for the former at each

TABLE VIII

Mean Gains in Comprehension and Speed of Reading on the Iowa Test of Silent Reading, Arranged by Dartmouth Percentile Rank on the Scholastic Aptitude Test, of Untrained Subjects of Dartmouth Visual Survey.

		Comprehension			Words/Minute		
Percentile Rank	N	Fall Mean	Mean Gain	Per Cent Gain	Fall Mean	Mean Gain	Per Cent Gain
80-99+	107	179.4	12.4	6.9	277.5	2.1	0.7
60-79	101	168.9	12.5	7.4	254.0	11.0	4.3
40-59	78	161.8	13.2	8.5	246.2	11.0	4.4
20-39	59	154.2	16.2	10.5	245.2	8.8	3.5
0-19	38	144.6	13.2	9.1	232.1	17.3	7.4

TABLE IX

Mean Gains in Comprehension and Speed of Reading on the Iowa and Booker Tests by the Remedial Reading Groups, Arranged by Dartmouth Percentile Rank on the Scholastic Aptitude Test, Subjects of Dartmouth Visual Survey.

		Iowa Test						Booker
		Comprehension			Words/Minute			Words/Min.
Percentile Rank	N	Fall Mean	Mean Gain	% Gain	Fall Mean	Mean Gain	% Gain	Mean Gain
80-99+	10	168.0	16.4	9.7	226.5	53.4	23.5	175.8
60-79	17	156.1	19.3	12.3	215.5	52.5	24.3	147.1
40-59	19	148.1	18.8	12.7	196.6	32.5	16.5	129.6
20-39	25	139.6	22.0	15.7	188.6	46.1	24.4	114.6
0-19	47	119.6	22.7	18.9	187.3	47.7	25.4	123.5

level. It is interesting to note that the gains in rate for the control group are lower at higher levels of scholastic aptitude. The reverse is true for the remedial group where all levels of scholastic aptitude have good gains, but the higher one seems to profit as much from the training as the lower.

In Table IX are also found the mean gains in rate made on the final Booker Test of Achievement in Silent Reading given each section at the conclusion of its training. These confirm the tendency shown above for students at the higher scholastic aptitude levels to profit as much or more from instruction as those at the lower level. It is probable that a selective factor enters into these results in that a number of these students of initial higher ability are volunteers and are thus characterized by superior willingness to learn.

Examination is also made of the reading gains in relation to proficiency in comprehension as shown by the September Iowa Test. This initial skill may influence gains made subsequently, and there is also a question concerning the extent to which the remedial instruction provided tends to sacrifice comprehension for rate. Students are again distributed into the same 5 percentile levels for their class at Dartmouth, only this time on the basis of September *comprehension* scores. These are shown in Table X which follows. Two tendencies are observed with

TABLE X

Mean Gains in Comprehension and Speed of Reading on the Iowa Test of Silent Reading (A)* for Trained and Untrained Subjects of Dartmouth Visual Survey, by Percentile Ranks (Dartmouth) in Rate of Reading on Iowa Test of Silent Reading (B)**.

	Trained			Untrained		
Percentile		Mean Gain			Mean Gain	
Rank	N	Comp.	Wds./Min.	N	Comp.	Wds./Min.
80-99+	6	—6.5	45.1	115	6.5	6.6
60-79	12	12.6	54.4	102	13.5	14.4
40-59	15	23.6	69.0	79	14.6	3.2
20-39	42	19.4	50.7	66	20.2	9.0
1-19	52	26.7	34.3	21	23.3	14.3

*Spring testing.
**Fall testing.

respect to mean gains in comprehension, (1) greater gains are made by those at the lower initial levels of scholastic aptitude among both remedial and control groups and (2) the differences in gain between these two groups favor neither one nor the other. In words read per minute, however, the remedial students at each comprehension level far surpass those corresponding to them among the untrained students. The suspicion that comprehension in reading may suffer as a result of accelerating speed appears to have no foundation in fact.

The comparisons just made suggest the desirability of classifying students according to initial rate scores for tabulation of gains in comprehension and rate of reading. They are again, therefore, distributed into percentile levels for their class at Dartmouth according to their rank in rate on the September Iowa. The mean gains for the resulting levels are found in Table XI. Students at the lowest level in rate (percentile ranks 1 to 19 inclusive) make large gains in the number of words read per minute. Those receiving instruction again lead by a considerable margin. The margin increases at the higher levels because of the smaller gains in rate made by the control group. The trained students, on the contrary,

TABLE XI

Mean Gains in Comprehension and Speed of Reading on the Iowa Test of Silent Reading (A)* for Trained and Untrained Subjects of Dartmouth Visual Survey, by Percentile Ranks (Dartmouth) in Rate of Reading on Iowa Test of Silent Reading (B)**.

Percentile Rank	Trained N	Trained Mean Gain Comp.	Trained Mean Gain Wds./Min.	Untrained N	Untrained Mean Gain Comp.	Untrained Mean Gain Wds./Min.
80-99+	—	—	—	109	12.3	—9.6
60-79	4	16.0	39.0	110	14.0	8.7
40-59	31	19.0	44.2	99	14.4	21.9
20-39	29	19.4	41.1	53	13.0	17.0
1-19	63	23.1	50.0	12	11.3	38.9

*Spring testing.
**Fall testing.

make satisfactory gains at all levels represented. In comprehension, the remedial students at the 3 lowest levels have mean gains exceeding those of the untrained students of 11.8, 6.4 and 4.6 points, respectively. The small number of students here do not allow determination of the significance of the differences in gains.

These analyses of gains for students classified on the 3 bases just reviewed suggest several tendencies, although the limited numbers involved do not allow for generalization. Untrained students just below average and those at or above average for their class on these 3 bases may

be expected to have a gain on an Iowa administered at the end of the year of 12 to 15 points in comprehension. Approximately the same mean gains will be obtained by those at the thirty-ninth percentile and below in September scholastic aptitude or in Iowa rate score. Those below the thirty-ninth percentile in initial comprehension, however, make larger gains in comprehension on the May Iowa. The means vary 20 to 23 points. If it may be assumed that 12 to 23 points may be gained at different percentile levels as a result of maturation and the stimulus of college life, then students taking remedial reading should show more than these gains for their respective levels, if the work has been of value to them. They do so except when the classification basis was initial comprehension.

Untrained students at or above the fortieth percentile of their class on these 3 bases do not manifest the same consistent tendency to gain in words read per minute as they do in comprehension. If classified by scholastic aptitude, gains range from 2 to 11 words; if by comprehension from 3 to 14.4 words and if by initial rate from —9.6 to 21.9 words. Untrained students below the nineteenth percentile make slightly better gains. The gains for the remedial students are greatly in excess of those of the untrained at all levels of initial scholastic aptitude rank and comprehension and rate in reading. We may say that the freshmen who entered Dartmouth in 1936, seriously deficient in either comprehension or rate, tend to gain more than average, so that on the May Iowa they are relatively less deficient.

The differences in gains in reading when students are classified by comprehension and by rate suggest that different students are placed at corresponding percentile levels on these 2 bases. To investigate this possibility, the Dartmouth percentile rank in comprehension of each man was determined in order to find in which quarter of the class it fell. Quarter I contains students scoring between 1 and 139; Quarter II those scoring between 140 and 158; Quarter III those scoring between 159 and 173; and Quarter IV those scoring 174 or above. Similarly on initial rate, Quarter I contains students scoring between 1 and 27; Quarter II those scoring between 28 and 32; Quarter III those scoring between 33 and 37; and Quarter IV those scoring 38 or better.

Each student's rank in both comprehension and rate was then determined and all those having a similar combination of ranks in rate and comprehension were placed together. Thirteen different com-

binations are found among the subjects, but it is observed that they fall into the following 5 categories: (1) combinations of ranks both low in comprehension and rate; (2) those low in comprehension and high in rate; (3) those average in both comprehension and rate: (4) those high in comprehension and low in rate and (5) those high in both comprehension and rate. The reading gains of the students in these 5 categories are tabulated with the results shown in Table XII which follows.

TABLE XII

Mean Gains in Comprehension and Speed of Reading on Iowa Test of Silent Reading of Trained and Untrained Subjects of Dartmouth Visual Survey, as Grouped by Both Comprehension and Rate Scores on Iowa Test of Silent Reading (B)*.

	Remedial Group			Control Group		
		Mean Gain			Mean Gain	
Group	N	Comp.	Wds. /Min.	N	Comp.	Wds. /Min.
Low in both comprehension and rate	78	24.8	44.0	31	19.2	19.8
Low in comprehension and high in rate	3	24.7	0.2	30	23.3	—13.3
Average in both comprehension and rate	34	19.9	49.7	150	14.9	15.1
High in comprehension and low in rate	10	6.2	67.4	17	6.5	33.5
High in both comprehension and rate	2	9.5	39.5	144	10.1	2.1

*Fall testing.

Scrutiny of those initially low in both comprehension and rate shows that both the remedial and the untrained students gain in comprehension and words per minute, but with greater gain (especially in speed) for the first group. Because of the mode of selection of students for remedial instruction, there are only 3 remedial subjects in this group comprising those low in comprehension and high in rate. However, for the 30 untrained students in this group, the results are mixed. They gain in comprehension to the extent formerly ascribed to maturation, but show a mean loss in words read per minute of 13.3. The greatest comprehension gain of the untrained is made by students in this group. The 150 untrained students classed initially as average in comprehension and rate make the average expected gains in comprehension with a mean gain in words read per minute of 15.1. The comprehension gain of the smaller number of remedial students is 5 points greater than that of the untrained, while the mean gain in words read per minute is 34.6 words. Few of either the trained or untrained students combine high comprehension with very low rate, but, with this type of student, the tendency

is toward increasing rate with slight gain in comprehension. It is noted that the highest gains in speed for any group are made by these students, with the trained doubling the gain of the untrained. Only 2 remedial students are high in both comprehension and rate, but for the 144 untrained students the tendency is for only a slight gain in comprehension and no change in words read per minute.

In academic points, the remedial students gain a mean of 2.1 more than the untrained students between the first and second semesters. This difference of 2.1 in mean points gain between the two groups is statistically significant, being 3.17 times the standard error of the difference. We cannot infer, however, that the remedial students do more reading or make more effective efforts to comprehend the assignments which they read. (See Table XIII which follows.) Nor can the difference in gain

TABLE XIII

Comparison between Remedial Reading Group and Control Group of Dartmouth Visual Survey in Mean Academic Points Gained from Mid-year to End of Year

Sections		N	Mean Academic Points First Semester*	Mean Academic Points End of Year	Mean Gain
Control Group		374	67.3	68.4	1.1
Remedial Groups**		124	50.4	53.5	3.2
Remedial Group***	1	18	45.3	49.8	4.5
	2	11	48.5	50.1	1.6
	3	11	50.6	51.2	0.6
	4	17	55.8	58.4	2.6
	5	21	55.2	57.4	2.2
	7	9	46.6	51.3	4.7
	8	19	41.0	46.7	5.7
	9	17	59.2	60.8	1.6
	10	7	42.0	48.9	6.9

*Multiplied by 2 to make scores comparable to end of year scores.
**Excludes the 6 duplicates of Group 7 and 3 incomplete records.
***See Table I for basis of group selection.

be attributed, with any assurance, to the participation of the former in remedial reading instruction. Many other factors may affect equally the performance of both groups.

The relationship between visual efficiency, reading skills and a number of other factors assumed to have a bearing upon success in college has been analyzed critically in a previous chapter of this report. In this connection, however, it is interesting to examine the ocular status of the remedial students in relation to their reading gains during instruction and for the year. In Table XIV, the remedial students are classified according to the diagnosis of their condition as determined by the ocular examination. The gains in comprehension and words read per minute

TABLE XIV

Mean Gains in Comprehension and Words per Minute during Year on Iowa Test of Silent Reading and Mean Gains in Words per Minute on Booker Test of Remedial Reading Group of Dartmouth Visual Survey. Subjects are Grouped according to Diagnosis of Ocular Condition.

		Mean Gain		
			Iowa	Booker
Ocular Condition	N	Comp.	Wds./Min.	Wds./Min.
No Defect	37	18.6	51.4*	147.9
Mild Refraction } Aniseikonia or Motor }	66	20.3	43.0	122.7
Severe Refraction	2	34.5	38.5	105.0
Severe Motor	3	28.3	19.6	120.0
Severe Aniseikonia	10	17.0	55.1*	114.6

*See discussion concerning these gains.

on the May Iowa Test and the gains in words read per minute on the Booker Test, which was given at the conclusion of their training period, are presented in Table XIV. Of the 118 remedial students for whom data are available, 37 show no defect, while 15 reveal unmistakable ocular defects. Through reference to Table XIV, it is seen that on the final test (the Booker Test of Achievement in Silent Reading) these 15 students make smaller gains than the 66 suspected of defect or the 37 without defect. The relative gains on the May Iowa do not differentiate conclusively the non-defective from those having defects, although the trends of difference suggest that ocular condition may influence rate of reading. The non-defective group has a mean gain in words read per minute higher than for any other group, except the 10 students apparently having aniseikonia. Of these10, however, 7 had been fitted with corrective lenses during the year, and, thus, presumably, had normal vision at the time of the Iowa examination in May. This fact may account for the greater gain of the aniseikonic subjects in May over their rate on the Booker Test at the conclusion of training, although the small number of cases limits the value of this statement.

Permanence of Results of Instruction. The gains recorded in May for the 127 remedial students give some measure of permanence, since the date of this second Iowa Test was just 6 months after training had been concluded for the 41 students in Sections 1, 2 and 3. It was approximately 4 months after training had been concluded for the 43 students in Sections 4, 5 and 7; and approximately one month after training ended for the 43 students in Sections 8, 9 and 10. The reading gains tabulated in Table XIV by sections show that all sections make mean gains well in advance of the scores in comprehension and words per minute which they had made in September.

As a check on such factors as permanence of the skills which might be influenced by the mental sets toward reading, it was decided to call in the remedial cases for another test early in the fall of their sophomore year. The date of this third test was one year after the end of training for the first 3 sections, 10 months after for the next 3 sections and 7 months after for Sections 8, 9 and 10. Notices were sent to the students who had returned to college, 118 of the original 127 (the reason for the balance of these dropping out was not determined) and, of these, 88 subjects were present for the test. There were 31 men from Sections 1, 2 and 3; 28 from Sections 4, 5 and 7 and 29 from Sections 8, 9 and 10. Since it was necessary to depend upon the good will of the students for voluntary attendance, personal letters were written to them.

Since only two forms of the Advanced Iowa Test of Silent Reading were available, it was necessary to use Form B, which had been administered to the students in September, 1936. More than a year, including a summer vacation, had intervened between the two applications of this form. It is doubtful, therefore, that any significant practice effects would carry over to this third test.

TABLE XV

Mean Scores in Comprehension and Rate on Iowa Test of Silent Reading of 88 Subjects of Remedial Reading Group of Dartmouth Visual Survey, Tested before and after Instruction.

Time of Test	Mean Score Comp.	Rate
September, 1936	138.1	26.7
May, 1937	157.2	33.2
November, 1937	168.0	38.4
Differences, May-November	10.8	5.2
Critical Ratio of Differences	3.1	3.8

In Table XV, we have reported the mean reading scores made by these 88 students in May and in the previous September. The mean for the group indicates that the gains are retained over a period of 6 months. There are gains over the May scores, and these are well above the original September scores. The differences between the November and May mean scores, in both rate and comprehension, are statistically significant.

Only one student makes a score lower than his original September score in comprehension and 4 do so in rate. Twenty-one fail to score as high in comprehension in November as in May, and 14 fail to score as high in rate.

The net change in reading for this group of 88 students may be observed by examination of Table XVI. It is seen that more than 95

per cent of these freshmen gain in the period from September, 1936, to November, 1937. These gains may be contrasted with slightly smaller percentages of gains between September, 1936, and May, 1937. For those who gain, the mean gain in comprehension and rate is larger over the longer period of time. Part of this difference may be due to maturation, part to unreliability of the test and part may be due to a delayed effect of the remedial instruction.

TABLE XVI

Comparison of Mean Gains and Losses in Comprehension and Rate, as Measured by the Iowa Test of Silent Reading Administered to 88 Subjects of Remedial Reading Group of Dartmouth Visual Survey in September, 1936, May, 1937 and November, 1937.

Iowa Test	September-May N	September-May Cent Per	September-May Gain Mean	September-November N	September-November Cent Per	September-November Gain Mean
Comprehension						
Gain	79	89.8	22.6	87	98.9	31.3
No Change	1	1.1	0.0	0	0.0	0.0
Loss	8	9.1	—7.8	1	1.1	—4.0
Rate						
Gain	71	80.7	8.9	84	95.5	12.3
No Change	4	4.5	0.0	0	0.0	0.0
Loss	13	14.8	—4.6	4	4.5	—3.2

The above figures indicate that the beneficial effects of instruction in reading are maintained for at least a period of one year. Only rarely does a student fall back to the level which he had reached before the remedial instruction began.

Summary. The program of remedial reading described in this chapter was developed during the academic year 1936-37 in an effort to solve a practical problem which had been recognized at Dartmouth College for some time. The solution of the problem required collection of data by tests and other means, study of types of deficiencies and methods of eliminating them, the provision of administrative procedures and development of methods of remedial instruction.

Eleven groups of students, which included 143 freshmen and 51 upper classmen, met twice a week for a total of 8 to 12 one-hour periods of instruction. Of these students, 97 had asked permission to enroll, 45 were requested to do the work primarily because of unsatisfactory scores on the Iowa Test of Silent Reading (Advanced Form B) and 52 poor readers were requested to attend because they had made unsatisfactory scholastic records.

The remedial techniques employed with each group (except Section 7) provided general information concerning problems of reading and

study, specific knowledge for the individual concerning his own particular deficiencies, much practice material for cultivation of skills in rate and a limited amount of material for the cultivation of skills in comprehension. The work was conducted so as to develop in students a sense of responsibility for applying the understanding and skills acquired in the remedial class to their regular work and for self-improvement after instruction had ceased.

An evaluation of the remedial program is shown by comparison of the progress in reading made by the trained and untrained students. The subjects are, thus, 127 freshmen who received training and 383 members of the same class who had not taken part in the remedial program. All of these men had taken the Iowa Test of Silent Reading, Advanced Form B, in September, 1936, and Form A in May, 1937, and had their eye-movements in reading photographed at the beginning and end of the academic year. The trained students who were still in college were given the Iowa Test of Silent Reading again in November of the following year, in order to determine the permanence of gains made during the previous year. The findings of this study indicate that:

1. The freshmen given remedial instruction make significantly greater gains in comprehension score, rate score and words read per minute than do the untrained students.

2. Eye-movement photography of the trained students made at the end of the training period and at the end of the academic year shows no significant change in fixations and regressions and a slight gain in rate.

3. Study of the reading gains of trained and untrained students of corresponding percentile ranks in scholastic aptitude suggests that:

a. The trained students consistently gain more than the untrained in comprehension and in rate.

b. The remedial students of lower scholastic ability make larger gains in comprehension than do those of higher scholastic ability. Among the untrained students, the gains are rather constant at each level of scholastic ability.

c. The remedial students of the higher levels of scholastic ability make slightly larger gains in rate than those of lower ability, but the reverse is true for the untrained. This finding suggests that the students of high scholastic aptitude can profit from training in rate as much as those of lower ability.

d. Remedial students of high levels of ability make much larger

gains than the lower group rate as measured by the Booker Test of Achievement in Silent Reading.

4. Study of the reading gains of trained and untrained students of corresponding percentile ranks on comprehension scores on the September Iowa Test of Silent Reading (Advanced Form B) suggests that:

a. Freshmen (both trained and untrained) with lower initial comprehension scores make larger gains in comprehension than those who make higher initial comprehension scores. Trained and untrained subjects make approximately the same gains when grouped by corresponding ranks.

b. Remedial students for all ranks of initial comprehension far exceed the untrained in gains in reading rate. The largest gains among the remedial students are made by those who have higher initial comprehension scores.

5. Study of the reading gains of trained and untrained students of corresponding ranks on rate scores on the September Iowa Test suggests that:

a. Remedial students with lower initial rate scores make larger gains in comprehension, but all trained students make more gains.

b. Remedial students of all ranks in initial rate far exceed the untrained students of corresponding rate. The largest gains of both trained and untrained students are made by the groups making the lowest initial rate scores.

6. Study of the reading gains of students grouped on both initial rate scores and comprehension suggests that:

a. Much of the gains in comprehension which the trained students make can be attributed to factors other than training, since the untrained students also make gains in comprehension.

b. Trained students of all groups make larger gains in rate than the untrained.

c. The largest gains in rate are made by students who have high comprehension and low rate scores on the initial test. The trained overcome their original deficiency in rate to a greater extent than do the untrained students.

d. Untrained students, below the average in initial rate scores, make gains in rate which vary according to their initial rate and comprehension scores.

7. The remedial students gain a mean of 2.1 more grade points

from the first to the second semester than do the untrained students. Although this small difference in gain is found to be statistically significant, it cannot be attributed to the remedial instruction alone.

8. Members of the remedial groups who have no visual defects make larger gains in rate (as measured by the Booker and Iowa Tests) than do those who have ocular difficulties. No significant differences in gains in comprehension are found.

9. Evidence is obtained that gains in comprehension and rate are maintained for periods of 6 months to one year after the completion of the remedial reading program.

PSYCHOLOGICAL FACTORS IN A CASE OF STRABISMUS*

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Georgetown, British Guiana, South America

Patient, aet. 9½ years, was brought in by her mother who wanted to know if anything could be done for the "cast" in her little girl's right eye. The mother was not quite sure at what age the "cast" was first noticed, whether it was before or after entry into school.

Examination revealed a total absence of the function of convergence. The right eye diverged all the more with every increase of effort during the push-up convergence test. This is recognized as an objective estimation of eye dominancy, or better still, as Parsons puts it, an estimation of the *original* rather than the *existing*, state of *handedness* based on the premise that right-eyed persons are right handed, and left-eyed individuals are left handed.[1]

There was 20/15 vision each eye. Pupillary reactions were normal, and ophthalmoscope examination negative.

Patient was left handed, but had been trained at school in the use of the right hand; she still uses the left occasionally, but the right hand is dominant now. This girl's left-eyedness was corroborated by the subjective tests of binocular pointing and monocular spying.

It might serve some useful purpose to mention here that this is one out of several cases which closely follows a repeated clinical observation of the writer, viz., that in a left handed person any tendency to strabismus will usually be found to be convergent in the left eye or divergent in the right eye and vice versa,[2] depending, of course, on whether the refractive anomaly is predominant or not; facial asymmetry and anatomical structure play no small part. This phenomenon *in the reverse order* has been noted in certain epileptics.[3]

Kraemer had concluded that if a monocular squint develops subsequently to satisfactory binocular vision and coordination in early life,

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[1] Canadian Optometrist. June, 1936. p. 154.
[2] Canadian Optometrist. December, 1936. p. 342.
Canadian Optometrist. June, 1937. p. 164.
[3] Optometric Weekly. October 15th, 1942. p. 1005.

* Submitted on July 2, 1943, for publication in the August, 1943 issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

the squint will be in the left eye if the person were right handed and vice versa;[4] but the writer goes one step further and predicts, not without exceptions, in which direction the squint will be likely to develop.

As was stated before, there was a noticeable cast in the right eye, a slight divergent strabismus of the concomitant variety.

The F and L test revealed a suppression of vision in the right eye, the patient reporting that F only was visible but at the same time she could switch vision over to the right eye seeing then L only. This switching of vision was purely voluntary as the patient would only alternate from one eye to the other when prompted to do so, otherwise she reported the letter F alone for prolonged periods without change.

Static retinoscopy exhibited a fluctuation of hyperopia changing from +0.25 to +0.75 each eye. Dynamic skiametry revealed +1.00 approximately each eye. No further tests were deemed advisable on account of suppression in the right eye, but experimentation with the D.B. 6 stereometric slide showed depth perception at zero whilst patient exhibited an uncanny accuracy in lining up the pegs of the Howard-Dolman depth perception apparatus.

At the conclusion of the examination the writer was asked if he thought the case was amenable to optical and orthoptic correction. The mother, who is of a highly strung disposition, at the same time volunteered the information that she was prepared for the worst since she was previously told by a specialist that the only course left open was an operation due to the hereditary status of the case, an aunt on the mother's side having a glaring divergent strabismus in the right eye. Incidentally, the aunt, too, was a left hander trained in the use of the right hand.

The idea of hereditary strabismus had already been a preconceived one in this family, not excluding the child. The possibility of the child's squint being an expression of a psychologic complex must not be overlooked.

The author cautiously informed the parent that it was very difficult to form an opinion at one sitting, but after a few more visits would let her know if the case was amenable to orthoptic treatment and by then he might be able to arrive at some conclusion re the causative factor or factors.

Nevertheless, at this stage of the conversation in the consulting room, (the strabismic aunt being present) the writer was already con-

[4] Canadian Optometrist. June, 1936. p. 172.

vinced that of all the possible causative agents in the production of squint the two psychological phases, the one the *result* of an enforced change of handedness, and the other due to a mental complex on heredity, were definitely predominant in this case. As subsequent events helped to show, the optical factor may have been contributory or may have conferred a predisposition by imposing in the first instance a handicap to coordination, a condition more aptly described today as an imbalance in neurological patterns.

After the successful treatment of the strabismus on purely psychophysiological principles a hyperopic esophoric condition was made manifest. Final correction was arrived at with the blur point technique now made possible after the restoration of binocular single vision. At this stage dynamic skiametry revealed +2.50 sph. each eye by the Sheard method.

The final outcome of orthoptic procedure proved that the eyes could overcome 100 △ Base-out at all distances and 20 △ Base-in at the near-point. The F and L test showed E for prolonged periods even under artificially induced stress.

This patient had exhibited anomalous projection during the course of treatment. The case was greatly assisted by the use of the cheiroscope, and intelligence of the child made it possible for the writer to explain physiologic diplopia and its significance. The Arneson Korector rendered yeoman service in the initial stages of breaking down the psychical concession of suppressed vision.

No serious disability or discomfort was reported by the patient. An intermittent diplopia which lasted four days seemed to amuse her immensely. There was some report of a bumpy appearance of the road especially when riding a bicycle but without annoyance or mishap.

In the light of past experience with just a few cases of crossed dominance it would have been very interesting to observe the effects of changing this child back to the use of the left hand; but it is a practical impossibility in dealing with certain parents as well as school teachers to expect cooperation in anything suggestive of a retrograde step or of an experiment such as placing an innocent child in the category of the guinea pig; though we also know, the application of orthoptics is nothing more than trial and error. It is amazing that the association of left handedness with evil omen is still deeply ingrained in the minds of many parents and teachers, not only in this country, but in England, Canada, and the U. S. A.

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CARE NEEDED IN THE SELECTION OF SUBJECTS FOR VISUAL REHABILITATION

The popular concept of aviation, as a sporting and interesting way to win the war, has resulted in a flood of applicants for the air services and a proportional number of rejections.

Some of these rejections have been for visual color defects of varying degree. This situation has suggested to certain optometrists, the attempt to remedy these defects by a series of what is euphemistically referred to as "treatments." By these treatments, rejected candidates reputedly become acceptable to the air corps.

It is realized and admitted that the primary objective of this procedure is to make it possible for some rejected candidate to be admitted

to the service of his own choosing, and because of the intransigeance of medical Army and Navy standards, leaving little room for the weighing and interpretation of findings, many candidates are rejected because findings classify them as borderline cases.

Under certain conditions it is also admitted that regardless of the methods used, the objective is at times desirable and entirely proper. However, it has its limitations and cannot be classified from a technical standpoint as an effective innovation in practice, subject to further development. The entire situation is comparable to an educational system wherein certain standards are set to assure that the matriculating candidate has acquired a modicum of knowledge and, more important, the habit of learning. Just before examination the mediocre student, not having acquired the habit of learning and realizing that his store of knowledge is insufficient to pass, decides to make a super effort to just get over the line and make passing grades. For three nights before the examination he crams and in a few hours he does the work that he should have done in three months. On the great day, tremulous and bleary-eyed, he oozes out of his overstuffed cranium just enough memorized facts to get a poor passing grade.

Now this technique denotes spirit, but not knowledge, and is of little benefit to the student. That is why cramming is a poor substitute for study. Most of the benefits of cramming are temporary and the knowledge is lost as soon as the examinations are over.

Thus too this optometric contribution in rehabilitation is valuable, but like cramming, it is of little or no permanent value. It should be considered in its proper light and not made a demi-science.

These comments are in criticism of the self esteem and loose wordage prevalent among certain optometric advocates of this work. The most obvious use of loose terminology is in connection with the "Cure of Color Blindness." These writers confuse relative color defects with color blindness. Total color blindness or absolute color blindness for red and blue-green are congenital defects and incurable in every sense of the word. It is true that even the totally color blind are capable of a certain very coarse color discrimination by their ability to identify certain reflectance values with certain named colors. This means that under fixed light conditions they can identify a gray as red, because through education, through the words of others, that particular shade of gray is known by everyone else as red, but in discrimination of shades of color, the color

blind will fail completely because there, he hasn't the benefit of experience and lighting conditions vary. It is possible that being given sufficient time even a total color blind person might be able to pass very simple color tests. But he would still be color blind. It is quite obvious that partial color defects by the same learning process can be masked through repeated concentration on, and identification of, subtle shades of colors. Currently this is frequently done by flashing colored lights into the subject's eyes, coupling this mesmeric procedure with the labels of light therapy, chrome therapy or similar names. The notion that selected wave-lengths of the visible spectrum have therapeutic properties is now an exclusive prerogative of optometry as chiropractice has virtually abandoned it. Very few of the advocates of color therapies has ever taken the bother to analyze the use, or justify his claim by a study of the energy value of his favorite frequency in his favorite light source. However, for the benefit of those readers who might think this is a suggestion, I hasten to say that his findings will be disappointing as the energy value is infinitesimal in proportion to ordinary daylight. Most apostles of light therapy have been content to associate their selection with psychic conditions such as blue being a melancholy color, green being restful and red being irritating. For those who wish to explore the psychologic virtues of colour, I recommend a little known article by J. P. Guilford, entitled: "There is a System in Color Preferences," published in the September 1940 issue of the JOURNAL OF THE OPTICAL SOCIETY OF AMERICA.

For some twenty years we have been bombarded by the enthusiastic representations of these advocates, that the application of certain bands of the spectrum are of therapeutic value, and blinded as we are by a faint glow of knowledge we again emphatically deny that light in its various form, being as cheap as it is, can be sold in small packages with any real benefit to optometric patients.

The use of irregular practices to qualify Army and Navy applicants is allowable if more good fliers and sailors and technicians are really made available for the armed forces, but if the result is to circumvent experience, it is comparable to sabotage.

It is a well known fact that marked physical defects result in poor "seat-of-the-pants" flying. An astigmatic lookout in the crows nest of a ship must be under a handicap. If certain standards have been adopted to insure good emergency flying and good performance of duties involving

difficult visual tasks, it is obvious that these standards are needed. If the "curing" of the color blind, and the "rehabilitation" of visual defectives, results in *temporarily* circumventing these regulations, much discretion must be exercised by optometrists in the selection of their cases.

The unjudicious encouragement given visual defectives and their promiscuous treatment to sneak by already fairly liberal standards, so that they may avoid a prosaic branch of the service and get into a more romantic one, should not be optometry's contribution to the war effort. If it is done by some of its less conscientious members, it should receive none but critical recognition in its literature.

Guy L. DuPlessis.

SPECIAL REPORTS

MEMORANDUM TO THE QUEBEC COMMITTEE ON SOCIAL WELFARE FROM THE COLLEGE OF OPTOMETRISTS AND OPTICIANS OF THE PROVINCE OF QUEBEC AND FROM THE SCHOOL OF OPTOMETRY AFFILIATED TO THE UNIVERSITY OF MONTREAL*

J. H. Lionel Hebert, Opt.D.[1]

Montreal, Quebec

I wish to thank you and the members of the Committee for giving us an opportunity of submitting our views and of explaining in a few words what optometry consists of, what the College of Optometrists and Opticians of the Province of Quebec is, and the part which optometrists can and should play in a program of sickness-insurance which is now being studied. I readily believe that all the members of the Committee know what optometry is but it seems to me that a clear definition of this profession is needed for purposes of this discussion.

What Optometry Is

The legal definition of the profession as mentioned in Article 17 of Chapter 274 of the Revised Statutes of the Province of Quebec, 1941, is as follows: "The employment of any means other than the use of drugs for the detecting and the measurement of errors of refraction such

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[1] Secretary of the College of Optometrists and Opticians of the Province of Quebec.

* Submitted June 5, 1943, for publication in the August, 1943 issue of the American Journal of Optometry and Archives of American Academy of Optometry.

as hypermetropia, myopia, presbyopia, astigmatism and asthenopia by the adaptation of ophthalmic glasses for the aid thereof. It also includes any examination of the sight by any means whatsoever other than the use of drugs for determining, correcting or improving acuteness of vision."

We define this profession scientifically by stating that optometry is the science and art of examining the eyes, their functions, and of employing the preventive or corrective means which will assure the maximum of vision and comfort. These means are muscular exercises and proper ophthalmic glasses. The optometrist's role consists in correcting the defects which result from improper conformation of the ocular globe as well as opthalmo-muscular deficiency. A university degree recognized by a provincial statute qualifies him and authorizes him to examine eyes and to seek, measure and correct abnormalities of eyesight. The optometrist is also able and qualified to detect any ophthalmic disease, to bring back defective acuteness of vision by following scientific data, and to help and relieve muscular insufficiency by corrective exercise of the eyes.

In brief, the professional duties of the optometrist are to examine the eyes in order to (a) detect errors of refraction, (b) ascertain defects in focussing and convergence, (c) detect pathological cases. To correct abnormalities of the eye he prescribes and furnishes ophthalmic glasses or collaborates with the ophthalmologist by referring to him real or suspected pathological cases.

Studies for the degree of bachelor of optometry last three years. They can be undertaken only after presenting to the university authorities (faculty of sciences section) a certificate in rhetoric, of second year arts (College) or their equivalent as determined by the matriculation bureau of the University of Montreal. These studies deal with the following subjects: philosophy, biology, drawing, chemistry, mathematics, physics, the physics of optics, the geometry of optics, theory of corrective classes, laboratory instruments, optical physiology, theoretical optometry, refractive instruments, skiascopy, ocular refraction, general anatomy, ocular anatomy, physiology and pathology, myology, hygiene, clinical and ophthalmological dissection, glasses, optometric clinics, orthoptics and deontology.

In order not to take up uselessly the precious time of this Committee, may I be permitted to leave with you, with this memorandum, a prospectus of the school of optometry in which we may see at pages 8, 9, 10, 11 and 12 a short summary of the course given by the professors on

the subjects above mentioned. This will allow me to state definitely that the optometrist is absolutely qualified and renders services to the community. Moreover, optometry has been officially recognized in this province by a statute which dates from 1904, that is, for the past 39 years.

What the College of Optometrists and Opticians of the Province of Quebec is

Founded in 1910 the College of Optometrists and Opticians of the Province of Quebec is of perpetual succession and has all the powers conferred upon civil corporation by the laws of the Province. It is composed of all optometrists, without exception, who practice their profession in the province or all who, in future, will have followed the course and passed successfully the examinations required by law; there are now 265 members in active practice.

No one is authorized to practice optometry in the province of Quebec unless such person has obtained his bachelor's degree in optometry and has moreover secured a license from the Council of the College of Optometrists and Opticians of the Province of Quebec (Article 18 of the Statutes previously cited).

As a result the Chairman and his eight elected governors are possessed of the required authority to speak in the name of the optometrists of Quebec.

In the same way as the College of Physicians and Surgeons and the College of Surgeon Dentists of the Province of Quebec, our College has absolute control over the practicing members and in addition sees that the provincial law, which enacts that no one may practice optometry without a license, is observed. An exception is made, however, for doctors duly authorized to practice medicine under the laws of this province. (Article 47 of Chapter 274 of the Revised Statutes of Quebec, 1941).

It results from this exception that two professional bodies in the province of Quebec are authorized, in virture of a special statute, to examine eyesight and prescribe glasses to correct abnormalities of eyesight.

Nevertheless, in the preamble to the sickness-insurance act there is no mention made of the optometrist. Therefore, it follows that there would be discrimination if one professional body were allowed to practice optometry within the scope of the sickness-insurance plan while another were refused this right. Moreover, in view of the exceedingly restricted number of doctors of medicine who have become specialized in

this branch of work, it would be impossible for them to handle all the work.

The Optometrist's Part in a Plan of Sickness Insurance

All recognize that the pupil, workman, manufacturer and proffessional man needs to see well with both eyes in order to do their work properly. And, semi-official statistics show that a very great proportion of the people are obliged to submit, at different intervals, varying between six months and three years, to examination of their sight either to verify the state of their vision or to make some change in their visual corrections.

In the Province of Quebec this work is done by 265 optometrists and a certain limited number of specialized doctors known as oculists or ophthalmologists.

As a great portion of the public consults an optometrist for examination of eyesight it seems only just that one specially trained in this profession should be given the right to practice his profession for the benefit of the great majority which has entrusted itself to his care for the past 39 years, in any sickness-insurance plan.

We have not thoroughly studied the incidental aspect of the profession, that of glasses, and we have no recommendation to make in this regard now. The reason for this is that, in the draft of the sickness-insurance act, it is alleged that an assessment of $26.00 a year is not sufficient, to cover all the dental care of adults or children. It seems, therefore, at first sight, that if the assessments are not high enough to cover dental costs they are even more insufficient to cover cost of glasses. However, Dr. P. C. Routley, general secretary of the Canadian Medical Association, has suggested in his memorandum presented here on April 6th last (and I am citing his text taken from the evidence and minutes of this day on page 146, section G, to the effect that) "All accessories, such as *glasses,* crutches, artificial limbs, etc., should be available when such are reasonably requested or authorized."

However, if your Committee considers it advisable to study this point more thoroughly I can assure it in advance of the full collaboration of the College of Optometrists and Opticians of the Province of Quebec as well as of the School of Optometry which I have the honor to represent today.

For the moment, seeing that the sickness-insurance bill does not

include furnishing of glasses to the insured, I will make recommendations only insofar as the examination of eyesight is concerned.

The College and School above-mentioned suggest, through my intermediary:

1—That Optometrists be represented, provincially as well as federally, on the committees or commissions which will operate the sickness-insurance act;

2—That examination of the acuteness of vision of children attending schools be compulsory;

3—That, in the work of ascertaining defects in sight, the services of optometrists be retained;

4—That clinics be established in various centers of the province for the examination of the sight and the furnishing of glasses, free of charge, to children whose parents do not earn enough to pay the assessment required under the Act;

5—That insured persons be left free to choose an optometrist or a doctor-oculist, to have their eyes examined;

6—That every optometrist in the province of Quebec who is in good standing in our College be eligible to practice under the sickness-insurance plan;

7—That the fees allowed optometrists for examination of eyesight be established by a representative body of this profession in agreement with a committee of Department of National Health or of the Sickness-Insurance Commission.

In conclusion it must be admitted that, in a plan of sickness-insurance of the scope of that now being proposed, measures should be taken in order that the insured may entrust the examination of his eyesight to either the optometrist or the oculist specialized in such work.

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TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

by J. Fred Andreae, Secretary

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

ACADEMY MEETS IN CLEVELAND

A plan to form a Junior American Academy in each of the optometry schools was formulated at a session of the executive council of the American Academy of Optometry, July 15, at the Hotel Cleveland, Cleveland, Ohio. According to their scholastic standing, a certain percentage of seniors will be selected for membership and will hear from time to time lectures on ethics and professional practice given by Academy Fellows to stimulate the spirit of profesisonalism. Examinations for Academy fellowships will be arranged in some of the schools, with members of the faculty as proctors.

To work out details of the program, the followning were selected: Dr. I. M. Borish, Northern Illinois College; Dr. Glenn A. Fry, Ohio State University; Dr. Albert Fitch, Pennsylvania State College of Optometry; Dr. Ernest A. Hutchinson, Los Angeles School; Dr. C. L. Treleaven, Columbia University; Dr. R. M. Moore.

It was announced that two years after graduation all members of the Junior Academy who have practiced optometry according to Academy standards will be admitted to fellowship.

To meet the needs of and give aid and advice to optometrists striving to establish themselves in strictly ethical practice, the council adopted a "Professional Practice Program," with the following Fellows named to a committee to arrange details: Drs. Don R. Paine, Irving M. Borish, Eugene Freeman and R. M. Moore.

Following the business session, members attended a dinner honoring Dr. Carl A. Radde, of Cleveland, for his translation of Hering's work, *Spatial Sense and Movements of the Eye*. Dr. Radde was presented with a three-volume set of Duke-Elder's work on ophthalmology.

Dr. D. G. Hummel, chairman of the program committee, presented plans for clinical demonstrations at the next annual meeting of the Academy, which will be called after the war.

Attending the sessions and dinner were Dr. Arthur P. Wheelock,

president, Des Moines, Iowa; Dr. J. Fred Andreae, secretary, Baltimore, Md.; Dr. William Greenspon, Bluefield, W. Va.; Dr. D. G. Hummel, Cleveland; Dr. I. M. Borish, Chicago; Dr. E. A. Hutchinson, Los Angeles; Dr. Don R. Paine, Topeka, Kan.; Dr. O. H. Johnson, Jonesboro, Ark.; Dr. E. J. Margaretten, New York; Dr. Carl A. Radde, Cleveland; Dr. W. S. Brent, Barberton, Ohio, and Dr. Glenn A. Fry, Columbus, Ohio.

ABSTRACTS

OCULAR DRUGS. N. C. Elvin. Eye, Ear, Nose and Throat Monthly. 1942, 21, 2, 20-22.

The various drugs used in eye therapy are classified into the following groups: (1) Anesthetics. (2) Mydriatics and cycloplegics. (3) Miotics. (4) Astringents and local antiseptics. (5) Other drugs and vitamins.

The anesthetics used are usually cocaine 2%, metycaine 2%, holocaine 1%, butyn 1%, nupercaine 1-500, pantocaine 0.5%. Butyn is the most effective corneal anesthetic. The common mydriatics are cocaine, adrenalin, ephedrine, and probably euphthalmine. Cycloplegics are atropine sulphate, homatropine hydrobromide, euphthalmine, scopolamine, hyoscine, duboisin sulphate. The most commonly employed miotics are eserine, physostigmine, pilocarpine hydrochloride, carbaminoyl cholin, and prostigmin bromide. The astringents and local antiseptics include most of the metallic salts, such as zinc, copper, silver, and mercury. There are also compounds involving the benzene ring or its derivatives, such as mercurochrome, metaphen, hexylresorcin, ariflavine, and proflavine. Other drugs such as optochin or ethyl hydrocuprein are used in pneumococcus infections of the eye; dionin is used to produce dilation of the conjunctiva.

The most common ointments are yellow oxide of mercury, ammoniated mercury, atropine sulphate, sulfathiazole and sulfanilamide. Vitamins A, B, C, and D are also used. Vitamin A for corneal ulcerations and night blindness. Vitamin B for optic neuritis and alcoholic amblyopia. Vitamin C for corneal disturbances, and Vitamin D for keratoconus and corneal ulcerations. R. J. B.

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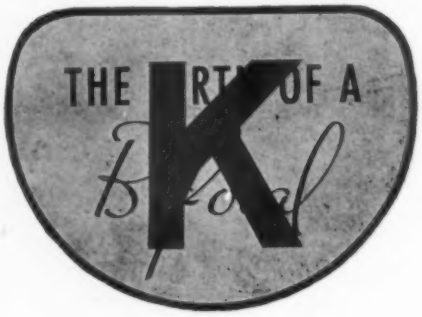

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